

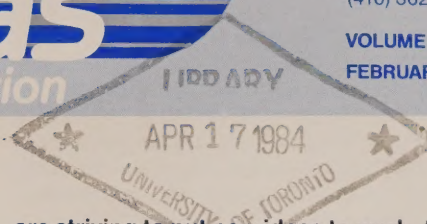


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# ideas

on innovation



"Ideas on Innovation" is a periodic newsletter from IDEA Corporation, that will present key issues emerging from technological advancement. Our objective is to stimulate thought and discussion among opinion leaders in all sectors: those who can influence Ontario's prominence in the technological revolution.

IDEA, an Ontario Crown corporation, brings a unique perspective to the debate on technological change. As a venture capital investor and a licensing broker for new products and processes, IDEA deals on a daily basis with entrepreneurs, private sector investors, inventors and innovation managers who

are striving to put new ideas to work. As a policy advisor to government, IDEA is transferring its "hands-on" knowledge of the problems and issues surrounding technological change to policymakers who can influence Ontario's adjustment to new technology.

In this introductory issue of "Ideas on Innovation", H. Ian Macdonald, Chairman of IDEA and President of York University, describes the apparent impasse in advancing the acceptance and diffusion of innovation in Ontario. He then outlines four objectives for consideration in overcoming these barriers.

## BEYOND 1984

### Rising to the Challenge of Innovation.

1984 is finally upon us. Amid a frenzy of discussion over Orwell's pessimistic warnings about the future, it is appropriate to consider and debate some of the real issues, emerging today, from the surge of new technology.

#### Advanced technology: an economic essential

International competition in high technology is heating up. The world's leading industrialized countries regard their ability to create and sell advanced technologies as essential to their economic futures. While our trading partners look more and more to advanced technology for economic salvation, Canada's current international position in the technological revolution is cause for concern.

As many have pointed out, we have a comparatively small, resource-based and largely foreign-controlled economy—it appears technically underdeveloped. For every \$100 of high technology products exported from and imported to Canada, we incur a deficit of about \$33. Our spending on research and development (R&D), proportionate to national income, continues to lag seriously behind our major trading partners and countries of comparable size and industrial structure. Canadian business conducts considerably less of the national R&D than do corporations in the rest of the OECD. And, perhaps of greatest concern, the Economic Council of Canada has recently found Canadian industry to be generally slow in adopting

and adapting new products and processes for their benefit.<sup>1</sup>

At the same time, the contribution of technology to our economic welfare becomes more evident every day. I need cite only these quick facts to support our observations on the growing importance of new technology:

- Canada's high technology manufacturing industries led all other industries in the 1970s in rate of output, growth, productivity and investment, and had the lowest increases in prices.
- Our country's balance of trade is increasingly determined by technology-intensive products and related services. For example, as a percent of Canada's overall trade turnover (exports and imports), high technology items rose to 25% in 1981 from 20% a decade earlier.
- Finally, as forthcoming editions of this newsletter will show, new technology production is labour intensive and often well-paying. Moreover, in the long run, it offers a stimulus to net job creation.

Senior policymakers are, of course, aware of Canada's technological capabilities. However, as budget deficits ballooned in successive economic recessions and as tax incentives for R&D were enriched to become among the most generous in the OECD<sup>2</sup>, governments found little scope to stimulate a broader base of innovation. Indeed, the 1983 budgets from both



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Ottawa and Queen's Park had supplementary papers arguing that, because of structural problems, further fiscal stimulus to R&D probably would not be cost-effective.<sup>3</sup>

### An impasse in the debate

These most recent policy statements on Canadian innovation have stirred little public debate and may indicate a general recognition that Canada's technical capabilities are constrained by high foreign ownership, small defence expenditures, a high proportion of small- to medium-sized firms, rising costs of R&D and government debt. In essence, I sense that discussion of our future technological capabilities may have reached an impasse. We realize our shortcomings and understand the need to accelerate and broaden innovation. However, in early 1984, we find no obvious place to turn to develop this capability.

### A time to agree on economic objectives

What better time to formulate economic objectives and initiatives to promote the rate and level of innovation? In this regard, my experience at IDEA Corporation, where entrepreneurs, investors and managers converge around new technology on a daily basis, has been instructive. Based on this experience, I see four objectives that deserve further discussion:

- Narrowing the risk capital gap;
- Strengthening the relationship between university research and industry;
- Stabilizing the economic climate for innovation; and,
- Improving the diffusion of new technology into industry.

Let me deal briefly with each of these objectives.

### (1) Development of deeper risk capital markets

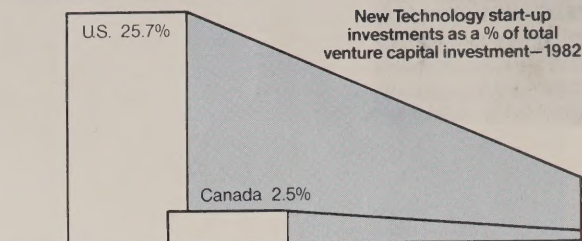
A longstanding issue in Canada has been the lack of risk capital for technological innovation. The gap in the capital market has been identified by numerous government and independent studies, beginning with the Gray Report in 1972.<sup>4</sup>

#### Opening the university gate

The venture capital gap in Canada is particularly acute at one of the principal sources of technology—the university gate. Research in our universities is sponsored primarily by the federal government's granting councils and these councils normally finance research to stages of development far from commercial application. Typically, two to four years of further development remain before the research can translate into a marketable product. To the venture capitalist outside the gate, such long lead times create unacceptable risk and onerous cost.

The factors behind this capital market deficiency are complex. Governments have attempted to deal with apparent gaps through such measures as the S.B.D.C.s in Ontario, limited partnerships and flow-through tax credits on R&D, and by establishing new instruments

### "Stimulating Innovation" <sup>5</sup>



such as IDEA Corporation. In assessing the adequacy of these initiatives, there are always concerns that the market be allowed to reach a balance between the supply of funds and the demand for funds. In other words, too much stimulus on the supply side (by expanding the availability of risk capital) would bid up the price of deals, raise risks, dilute management expertise and perhaps ultimately damage the market. In response to this concern, we should bear in mind the recent U.S. experience. A growing supply of venture capital south of the border appears to have induced entrepreneurial activity—the more investment funds available, the more entrepreneurs come out from the woodwork (and the labs!). In other words, favorable capital markets are acting as a supply-side stimulus to technological development.

### (2) Broadened university-industry relations

Until recently, the federal government and universities conducted more than half of Canadian R&D—the highest proportion by far among major OECD countries. Canadian universities perform about 20% and finance about 10% of national R&D, but only a very small part of this activity is under contract to industry. This key role of the university in Canada dictates that it be a major influence in raising national levels of technology. It also makes it imperative (more so than in other countries) that beginning now, Canadian industry's needs for technology become intertwined with university capabilities. This interrelationship can be built on three fronts: first and foremost, sponsored research; second, technical training on a continuous basis back and forth between industry and the classroom; and last, expanding the base of entrepreneurs and their associated attitudes.

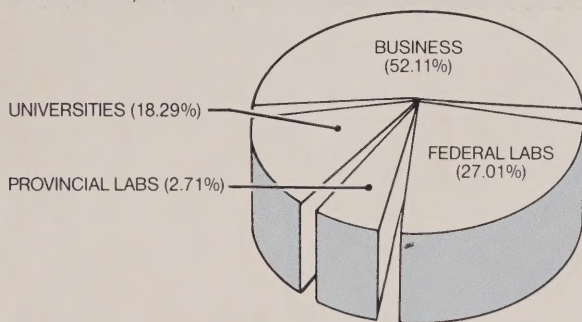
### University research must serve industrial needs

Sponsored research in our universities evokes legitimate concerns. These concerns typically relate to two issues: more applied research could threaten the conduct of pure research that ultimately will spawn the products and processes beyond year 2000; and second, sponsored research can distort the central objectivity of science and can abuse taxpayers' funding of the university. These are difficult and real issues with a divergence of opinion in academia itself.



Yet in the competitive realities of 1984, when technology increasingly influences national output and employment, there can be no question that the university must serve industrial needs in a broader and more effective manner. Indeed, in my view, this objective is so critical that we need to begin an in-depth assessment of how to structure and re-organize incentives and disincentives to link the university to business. In the United Kingdom, for instance, policymakers are now considering a bonus provision within the university granting system whereby 25¢ is provided for every \$1.00 obtained in industrial contracts. It is my hope that Ontario's task force on universities will examine such an approach... the "carrot" instead of the "stick"...in its deliberations over the future role of these institutions in our economy.

**"The Performers" <sup>6</sup>**  
R&D in Ontario, 1980



### (3) A favorable economic climate for innovation

According to a recent U.S. government study on high technology, "innovative activity and the willingness to apply technological advances are directly and substantially affected by the general economic environment and government macroeconomic policies."<sup>7</sup> This same conclusion was reflected in a recent poll of Canadian high technology firms in which industry identified a more favorable economic climate as the first priority.<sup>8</sup>

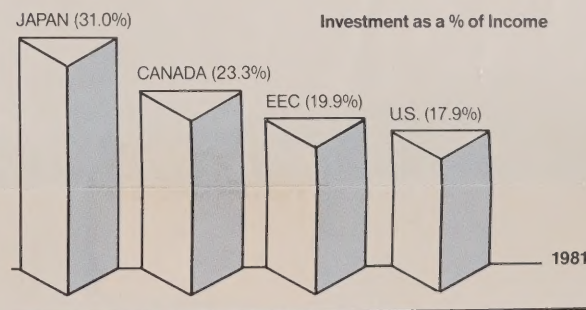
The relationship between stabilization policy and technological advance is not easily identified. Possibly the most visible link has been established in Japan. In that country, macroeconomic management has contributed to a consistently high rate of savings, relatively stable domestic demand, low inflation, and a dynamic shift of resources across sectors. In turn, this has led to unparalleled levels of capital formation in Japan, most recently in new product and process development and world leadership in key technologies. These policies contrast to the stop-go monetary and fiscal policies conducted by other western governments in the 1970s and 1980s that have worked against support of innovation: the long-term orientation in private investment.

### U.S. experience

The U.S., to a degree, has isolated its technology industries from the harmful effects of its unstable economy and macroeconomic policies through a massive and prolonged military and space program. This program has ensured a predictable market for long-term, risky R&D and high technology production. For example, an estimated 60% of U.S. electronics research (the leading R&D industrial sector) is related to this market. In practice, the U.S. has adopted its own unique form of stabilization policy for the technology sectors of its economy.

In fundamental ways, Canada cannot emulate Japan and the U.S. in managing a climate for high technology. To varying degrees, our monetary policy follows the U.S. and our fiscal policies also conform within these limits. However, we should not lose sight of this third objective—improving the rate of private sector capital formation and, in turn, innovation. It is particularly timely that this gain priority in economic policy for the mid-1980s: the capital demands of governments in Canada have reached unprecedented levels and threaten to continue to overshadow the pool of savings available for productive investment; and the repatriation potential in the large group of Canadian subsidiary firms will be enhanced by higher productivity resulting from new process technology. In confronting the prospect for even greater international mobility of capital, we must ensure our economy is attractive to long-term investment.

### "The Japanese Secret" <sup>9</sup>



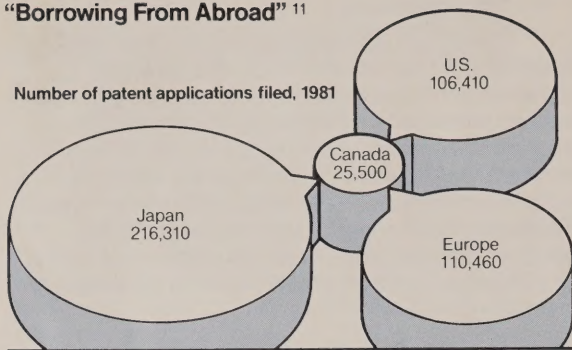
### (4) Improved diffusion of new technology to existing industry

The major adjustment of Ontario's economy to changing international competition and technology will happen not as much through the development of brand new firms or industries as by existing businesses adopting and adapting "best practice" technology. In this regard, a recent study by the Economic Council of Canada found that our small- and medium-sized firms (accounting for more than half of business GNP) are generally slow in grasping new production technologies.<sup>10</sup>



## "Borrowing From Abroad"<sup>11</sup>

Number of patent applications filed, 1981



Reasons for slow diffusion are the difficulties in obtaining information on new techniques, applying these techniques to the plant and financing the conversion of production. Ontario has recognized the importance of technology diffusion in restructuring its manufacturing industries. In this province, six technology centres are now advising firms on new production processes.

### Importing technology

I expect that governments will give increasing priority to importing foreign technology to enhance our industrial competitiveness. These efforts will be crucial and, as Japanese post-war experience shows, could be highly successful in stimulating innovation throughout the economy.

Canada's experience in importing technology has shown there are dangers in relying on foreign technology. Frequently, imported technology is "old" or comes with restrictions on export activity. These characteristics can limit long-term profitability within the firm which, in turn, constrains that firm from developing its own technology.

However, it is apparent that no country can be a technological leader in every area and all can learn from international experience. The problems inherent in importing technology must be recognized, but means and mechanisms for using it as a stepping stone to broader indigenous innovation in Canadian industry should be developed.

### Meeting the challenge

Perhaps the most important point to recognize is that the achievement of a higher level of technological innovation will not happen overnight. The real task is to turn our attention to the frontier of economic growth with an understanding that the encouragement of innovation and the application of technology is a lengthy and difficult process.

My view of 1984 and beyond is optimistic. Many of these issues are now being addressed and I think we shall find, not a dizzying head-over-heels adjustment, but a gradual one. Indeed, by the time we have been fully won over by the "new" technology, we will find that we have created, in Ontario, more competitive and efficient industries, better positioned for economic and technological progress in the future.

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### Footnotes

- <sup>1</sup> Economic Council of Canada, *The Bottom Line: Technology, Trade and Income Growth*, 1983.
- <sup>2</sup> D.G. McFetridge and J.P. Warda, *Canadian R & D Incentives: Their Adequacy and Impact*, Canadian Tax Foundation, 1983.
- <sup>3</sup> Budget Papers, tabled in the House of Commons, April 19, 1983 and R & D and Economic Development in Ontario: A Discussion Paper, May 10, 1983.
- <sup>4</sup> Gray Task Force, *Foreign Direct Investment in Canada*, 1972.
- <sup>5</sup> Venture Economics and ACVCC.
- <sup>6</sup> Statistics Canada, *Annual Review of Science and Statistics*, 1982.
- <sup>7</sup> USDC, *An Assessment of U.S. Competitiveness in High Technology Industries*, 1983, p. 17.
- <sup>8</sup> CATA Priorities and Planning Poll Report, 1982.
- <sup>9</sup> *National Accounts* (Annual OECD publication).
- <sup>10</sup> Economic Council of Canada, op. cit., P. 52.
- <sup>11</sup> World Intellectual Property Organization, *Industrial Property Statistics*, 1981.

Note: International patent comparisons are problematic due to procedural variations.